

What is claimed is:

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1. A method for providing glutamine supplementation to a human comprising the oral administration of an effective amount of N-acetyl L-glutamine, or a nutritionally acceptable salt thereof.
  2. A method according to claim 1 in which said human is administered at least 0.7 mmoles/kg/day of N-acetyl-L-glutamine or a nutritionally acceptable salt.
  3. A method according to claim 1 in which said human is administered at least 1.0 moles/kg/day of N-acetyl-L-glutamine or a nutritionally acceptable salt.
  4. A method according to claim 1 in which said human is administered at least 1.5 mmoles/kg/day of N-acetyl-L-glutamine or a nutritionally acceptable salt.
  5. A method according to claim 1 wherein said nutritionally acceptable salt is selected from the group consisting of: lithium, sodium, potassium, calcium, magnesium, and aluminum, ammonium, tetramethylammonium, tetraethylammonium, methylamine, dimethylamine, trimethylamine, triethylamine, diethylamine, ethylamine, tributylamine, pyridine, N,N-dimethylaniline, N-methylpiperidine, N-methylmorpholine, dicyclohexylamine, procaine, dibenzylamine, N,N-dibenzylphenethylamine, 1-phenamine, N,N'-dibenzylethylenediamine, ethylenediamine, ethanolamine, diethanolamine, piperidine, piperazine, and mixtures thereof.
  6. A method according to claim 1 wherein said human suffers from a condition selected from the group consisting of: gastrointestinal surgery, gastrointestinal resection, small bowel transplant, post surgical trauma, starvation, critical illnesses and injuries, multiple trauma, short bowel syndrome, burns, bone marrow transplant, AIDS, oral mucositis, cancer, Crohn's disease, necrotizing enterocolitis, prematurity of the gut, infections of opportunity, gut deterioration associated with particular treatments, restricted oral feeding, and combinations thereof.
  7. An aqueous solution containing:
    - a) from 30 mEq to 95 mEq of sodium per liter;
    - b) from 10 mEq to 30 mEq of potassium per liter;
    - c) from 10 mEq to 40 mEq of citrate per liter;
    - d) less than 3.0 wt./wt.% of one carbohydrate; and

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- e) at least 5.0 mmoles N-acetyl-L-glutamine, or a nutritionally equivalent salt thereof, per liter of solution.
8. An aqueous solution according to claim 7, containing 20 mmoles to 300 mmoles of N-acetyl-L-glutamine or a nutritionally equivalent salt thereof per liter of solution.
9. An aqueous solution according to claim 7, containing 25 mmoles to 200 mmoles of N-acetyl-L-glutamine or a nutritionally equivalent salt thereof per liter of solution.
10. An aqueous solution according to claim 7, wherein said nutritionally acceptable salt is selected from the group consisting of: lithium, sodium, potassium, calcium, magnesium, and aluminum, ammonium, tetramethylammonium, tetraethylammonium, methylamine, dimethylamine, trimethylamine, triethylamine, diethylamine, ethylamine, tributylamine, pyridine, N,N-dimethylaniline, N-methylpiperidine, N-methylmorpholine, dicyclohexylamine, procaine, dibenzylamine, N,N-dibenzylphenethylamine, 1-phenamine, N,N'-dibenzylethylenediamine, ethylenediamine, ethanolamine, diethanolamine, piperidine, piperazine, and mixtures thereof.
11. An aqueous solution according to claim 7, wherein said aqueous solution further contains chloride.
12. An aqueous solution according to claim 7, wherein said carbohydrate is a mixture of dextrose and fructose.
13. An aqueous solution according to claim 7, wherein said carbohydrate is present in a quantity of less than 3.0 wt/wt%.
14. An aqueous solution according to claim 7, wherein said sodium is present in the quantity of 30mEq/L to 95 mEq/L.
15. An aqueous solution according to claim 7, wherein said sodium is selected from the group consisting of sodium chloride, sodium citrate, sodium bicarbonate, sodium carbonate, sodium hydroxide and mixtures thereof.
16. An aqueous solution according to claim 7, wherein said potassium is present in the quantity of 10 mEq/L to 30 mEq/L.

17. An aqueous solution according to claim 7, wherein said potassium is selected from the group consisting of potassium citrate, potassium chloride, potassium bicarbonate, potassium carbonate, potassium hydroxide and mixtures thereof.
18. An aqueous solution according to claim 11, wherein said chloride is present in the quantity of 30 mEq/L to 80 mEq/L.
19. An aqueous solution according to claim 11, wherein said chloride is selected from the group consisting of potassium chloride, sodium chloride, and zinc chloride.
20. An aqueous solution according to claim 7, wherein said citrate is present in the quantity of 20 mEq/L to 40 mEq/L.
21. An aqueous according to claim 7, wherein said citrate is selected from the group consisting of potassium citrate, sodium citrate, and citric acid.
22. An aqueous solution according to claim 7, further comprising at least one flavor.
23. An aqueous solution according to claim 7, further comprising at least one artificial sweetener.
24. An aqueous solution according to claim 7, further comprising at least one gelling agent selected from the group consisting of agar, alginic acid and salts, gum arabic, gum acacia, gum talha, cellulose derivatives, curdlan, fermentation gums, furcellaran, gelatin, gellan gum, gum ghatti, guar gum, iota carrageenan, irish moss, kappa carrageenan, konjac flour, gum karaya, lambda carrageenan, larch gum/arabinogalactan, locust bean gum, pectin, tamarind seed gum, tara gum, gum tragacanth, native and modified starch, xanthan gum, in a quantity sufficient to support a self supporting three dimensional structure.
25. An aqueous solution according to claim 7, further comprising rice flour.
26. An aqueous solution according to claim 7, further comprising an indigestible oligosaccharide.
27. A liquid nutritional formula comprising :
  - a) a protein component, which comprises from 8 to 35% of the total caloric content of said liquid nutritional formula;
  - b) a carbohydrate component, which comprises from 36 to 76% of the total caloric content of said liquid nutritional formula;

c) a lipid component, which comprises from 6 to 51% of the total caloric content of said liquid nutritional formula; and  
1 to 23% on a caloric basis of the protein component in the form of N-acetyl-L-glutamine or a nutritionally acceptable salt thereof.

28. An adult liquid nutritional formula comprising :

- a) a protein component, which comprises from 14 to 35% of the total caloric content of said liquid nutritional formula;
  - b) a carbohydrate component, which comprises from 36 to 76% of the total caloric content of said liquid nutritional formula;
  - c) a lipid component, which comprises from 6 to 51% of the total caloric content of said liquid nutritional formula; and
- at least 35 mmoles of N-acetyl L-glutamine, or a nutritionally acceptable salt thereof, per 1000 kcal of nutritional formula.

29. A nutritional formula as defined in claim 28, wherein said formula comprises 35 mmoles to 160 mmoles of N-acetyl-L-glutamine, or a nutritionally acceptable salt thereof, per 1000 kcal of nutritional formula.

30. A liquid nutritional formula for a non-adult patient comprising :

- a) a protein component, which comprises from 8 to 25% of the total caloric content of said liquid nutritional formula;
  - b) a carbohydrate component, which comprises from 39 to 44% of the total caloric content of said liquid nutritional formula;
  - c) a lipid component, which comprises from 45 to 51% of the total caloric content of said liquid nutritional formula; and
- at least 5.0 mmoles of N-acetyl L-glutamine, or a nutritionally acceptable salt thereof, per 1000 kcal of nutritional formula.

31. A nutritional formula as defined in claim 30, wherein said formula comprises 5.0 mmoles to 32 mmoles of N-acetyl-L-glutamine, or a nutritionally acceptable salt thereof, per 1000 kcal of nutritional formula.

32. A liquid nutritional formula according to claim 27, wherein said nutritionally acceptable salt is selected from the group consisting of: lithium, sodium, potassium, calcium, magnesium,

and aluminum, ammonium, tetramethylammonium, tetraethylammonium, methylamine, dimethylamine, trimethylamine, triethylamine, diethylamine, ethylamine, tributylamine, pyridine, N,N-dimethylaniline, N-methylpiperidine, N-methylmorpholine, dicyclohexylamine, procaine, dibenzylamine, N,N-dibenzylphenethylamine, 1-phenamine, N,N'-dibenzylethylenediamine, ethylenediamine, ethanolamine, diethanolamine, piperidine, piperazine, and mixtures thereof.

33. A liquid nutritional formula according to claim 27, containing less than 1.0 g of pyroglutamic acid per 1500 kcal of formula.

34. A liquid nutritional formula according to claim 27, wherein said formula is an adult formula, and the protein component comprises from 14 to 35% of the total caloric content of said liquid nutritional formula; the carbohydrate component comprises from 36 to 76% of the total caloric content of said liquid nutritional formula; the lipid component comprises from 6 to 41% of the total caloric content of said liquid nutritional formula; and the N-acetyl-L-glutamine or a nutritionally acceptable salt thereof, comprises 1 to 25% on a caloric basis of the protein calories.

35. A liquid nutritional formula according to claim 27, wherein the formula is for non-adults, and the protein component comprises from 8 to 25% of the total caloric content of said liquid nutritional formula; the carbohydrate component comprises from 39 to 44% of the total caloric content of said liquid nutritional formula; the lipid component comprises from 45 to 51 of the total caloric content of said liquid nutritional formula; and the N-acetyl-L-glutamine or a nutritionally acceptable salt thereof, comprises 1 to 12% on a caloric basis of the protein calories.

36. A liquid nutritional formula according to claim 27, wherein said liquid nutritional formula is administered orally.

37. A liquid nutritional formula according to claim 27, wherein said liquid nutritional formula is administered enterally.

38. A liquid nutritional formula according to claim 27, further comprising vitamins and minerals selected from the group consisting of calcium, phosphorus, sodium, chloride, magnesium, manganese, iron, copper, zinc, selenium, iodine, chromium, molybdenum, m-inositol, carnitine, taurine, Vitamins A, C, D, E, K and the B complex, and mixtures thereof.

39. A liquid nutritional formula according to claim 27, wherein said lipid component is selected from the group consisting of coconut oil, soy oil, corn oil, olive oil, safflower oil, high oleic safflower oil, MCT oil (medium chain triglycerides), sunflower oil, high oleic sunflower oil, palm oil, palm olein, canola oil, fish oil, palm kernel oil, menhaden oil, soybean oil, cottonseed oil, lecithin, lipid sources of arachidonic acid and docosahexanoic acid, structured lipids, and mixtures thereof.

40. A liquid nutritional formula according to claim 27, wherein said protein component comprises intact protein selected from the group consisting of soy based protein, milk based protein, casein protein, whey protein, rice protein, beef collagen, pea protein, potato protein, and mixtures thereof.

41. A liquid nutritional formula according to claim 27, wherein said protein component comprises hydrolyzed protein selected from the group consisting of soy protein hydrolysate, casein protein hydrolysate, whey protein hydrolysate, rice protein hydrolysate, potato protein hydrolysate, fish protein hydrolysate, egg albumen hydrolysate, gelatin protein hydrolysate, a combination of animal and vegetable protein hydrolysates, and mixtures thereof.

42. A liquid nutritional formula according to claim 27, wherein said protein component comprises free amino acids selected from the group consisting of tryptophan, tyrosine, cyst(e)ine, methionine, arginine, leucine, valine, lysine, phenylalanine, isoleucine, threonine, histidine, carnitine, taurine, glycine, alanine, serine, cystine, thyroxine, aspartic acid, asparagine, glutamic acid, glutamine, hydroxylysine, proline, hydroxyproline and mixtures thereof.

43. A liquid nutritional formula according to claim 27, wherein said carbohydrate component is selected from the group consisting of hydrolyzed, intact, natural and chemically modified starches sourced from corn, tapioca, rice or potato in waxy or non-waxy forms; sugars such as glucose, fructose, lactose, sucrose, maltose, high fructose corn syrup, corn syrup solids; and mixtures thereof.